

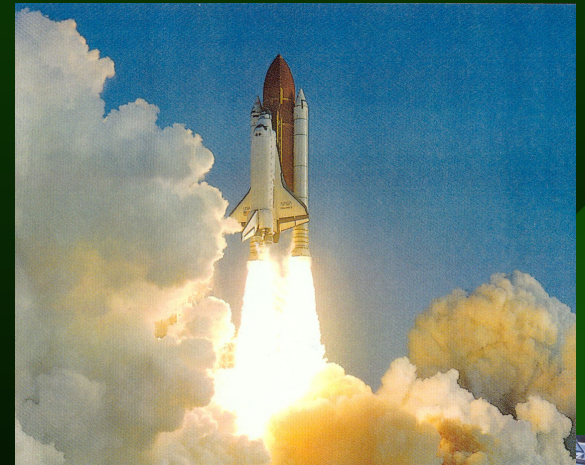
Industrial Case Studies in Energy Efficiency, Pollution Prevention and Sustainable Development

Bruce Taylor, P.Eng.

Great Lakes Regional
Pollution Prevention
Roundtable (GLRPPR)
August 7, 2003



Enviro-Stewards Inc.
Engineers & Scientists



Agenda

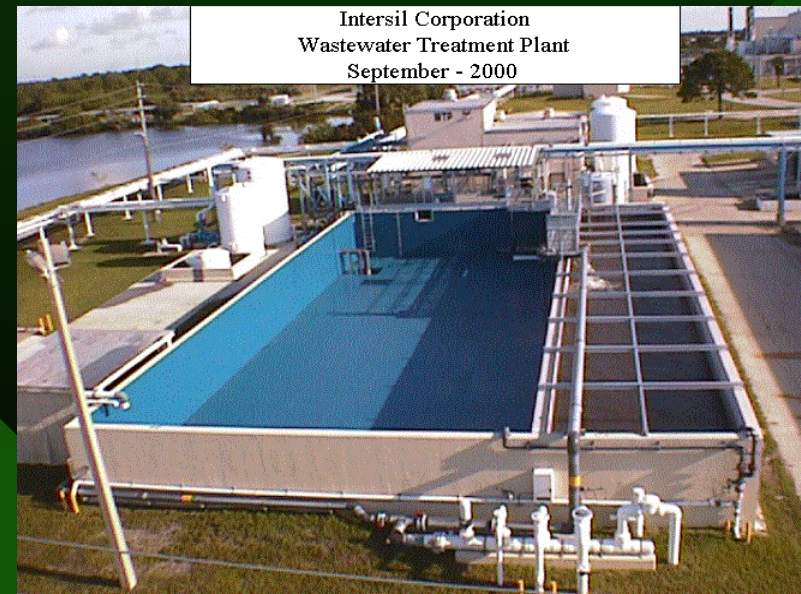
1. Introductions
2. Energy Efficiency & Cleaner Production Studies
 - Benefits
 - General Approach
3. Industrial Case Studies
 - Steam/Condensate/Chiller Efficiency
 - Process Electricity Conservation
 - Compressed Air Savings
 - Transportation Fuel Consumption
 - Sustainable Development
4. Questions & Answers

1. Introductions

Speaker: Bruce Taylor, P. Eng.
President, Enviro-Stewards Inc.

Dedicated to helping our clients:

- conserve their resources, and
- effectively address their environmental liabilities



2. E2 & CP Study

A detailed and systematic assessment of a company's processes and wastes to:

- improve process efficiency, and
- evaluate opportunities to reduce energy, water and chemical use and reduce contaminant loadings at source

Benefits of E2 &CP

1. Identification and Justification of Cost-Effective Reduction Measures
2. Reduction of Raw Material Consumption, Increase Product Yields and Decreased Labor and Energy Usage
3. Recovery of Waste Materials in a Concentrated State for Reuse/Recycle
4. Increased Knowledge of Processes, Systems and Waste Reduction Techniques
5. Reduced size, complexity and operating Cost of treatment facilities
6. Improved Corporate Image and Morale

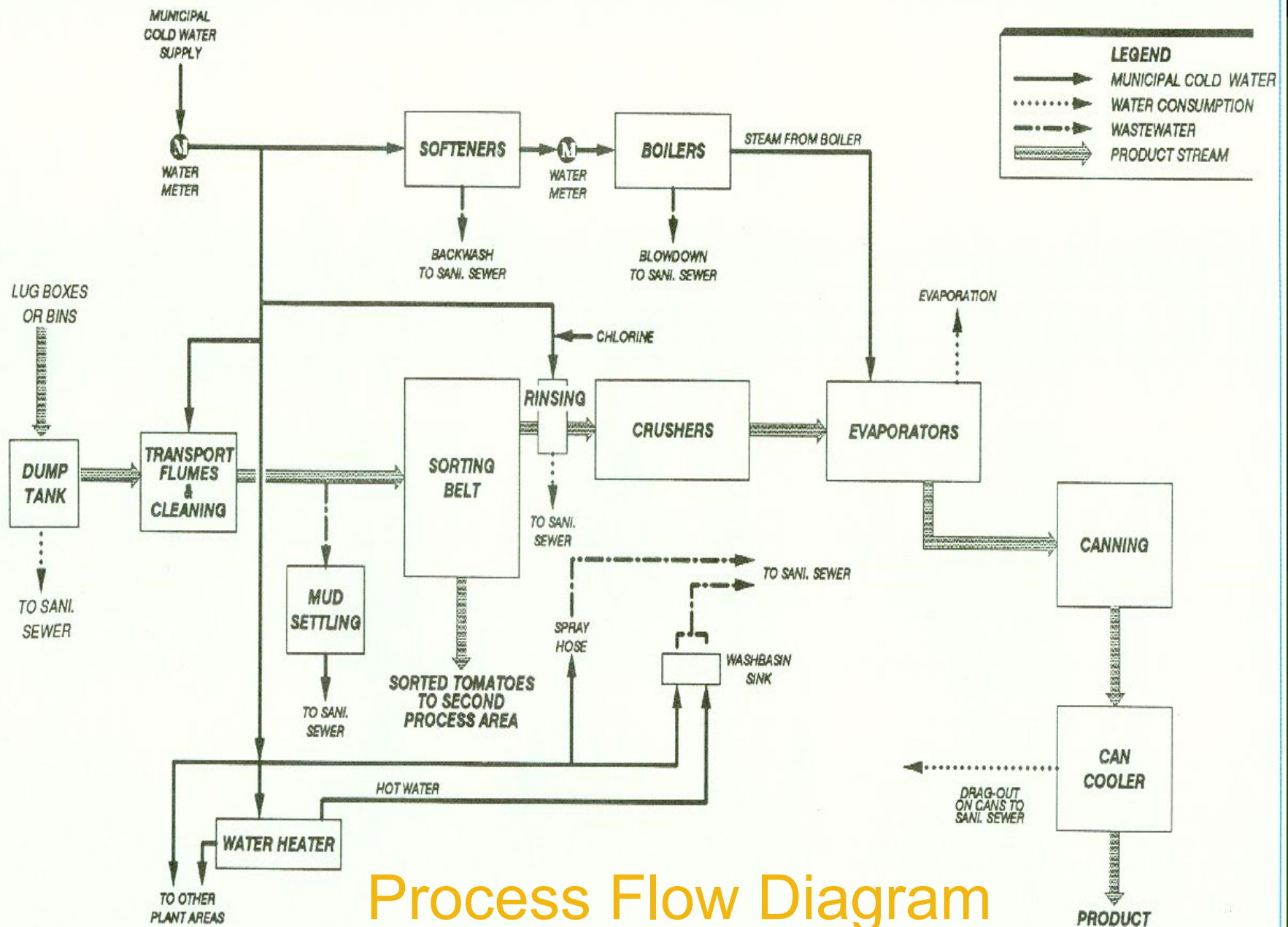
General Project Approach

1. In-Plant Study

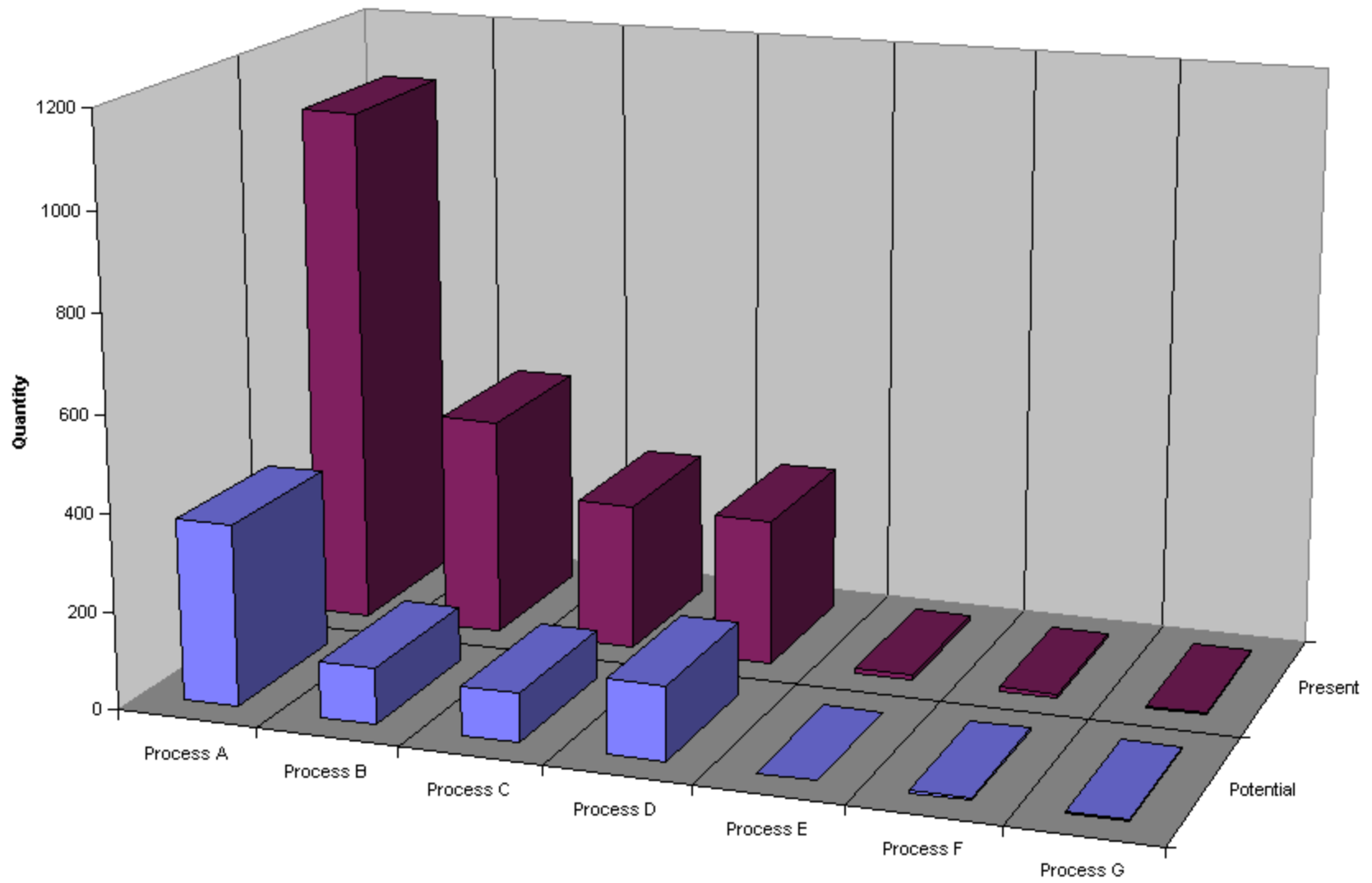
2. Engineering Evaluation

In-Plant Study

- Investigating energy and water using processes and waste generating operations
- Quantifying Process Inputs and Outputs
- Preparing Process Flow Diagrams (PFDs), Plant Layouts and Water, Energy & Material Balances



Material/Energy Balance Pareto Chart



Engineering Evaluation

- Identifying Reduction, Reuse and Recycling Opportunities
- Selecting Effective Alternatives for Conceptual Design
- Determining Payback Periods and Completing Cost/Benefit Analysis
- Preparing an Implementation Plan

Determining Actual Cost of Losses

- Quantity of Steam 10,000 lb/d
- Direct Water Losses 1,000 lgpd (\$2,300/yr)
- Indirect Water Losses 350 lgpd (\$800/yr)
- Boiler Chemicals & Sludge Disposal (\$2,500/yr)
- Energy loss in Condensate & Blowdown (\$2,000/yr)
- Energy Loss of Steam Phase Change (\$16,600/yr)

Cost of Lost Condensate \$7,600/yr (\$21/1000 lgal)

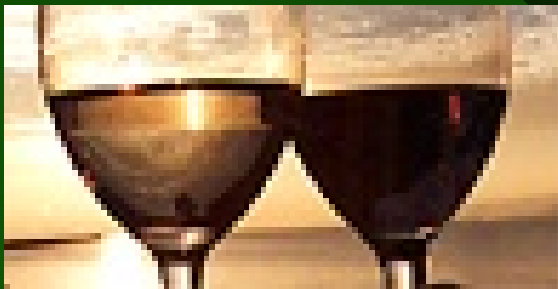
Total Cost of Lost Steam \$24,200/yr (\$66/1000 lgal)

3. Industrial Case Studies

- **Steam/Condensate/Chiller Efficiency**
Tire Plant, Kitchener, Winery, Niagara Falls
- **Process Electricity Conservation**
Kennedy Space Center & Cape Canaveral, Florida
- **Compressed Air Savings**
Truck Maintenance, Toronto, Food Plant, Niagara Falls
- **Transportation Fuel Consumption**
Dynamic Fuels, Pickering
- **Sustainable Development**
Las Lajas Agricultural Cooperative, El Salvador

Steam, Condensate and Chiller Efficiency

E2 and CP assessment at this tire manufacturing facility identified steam/condensate and water savings of \$300,000/yr with 2 yr payback



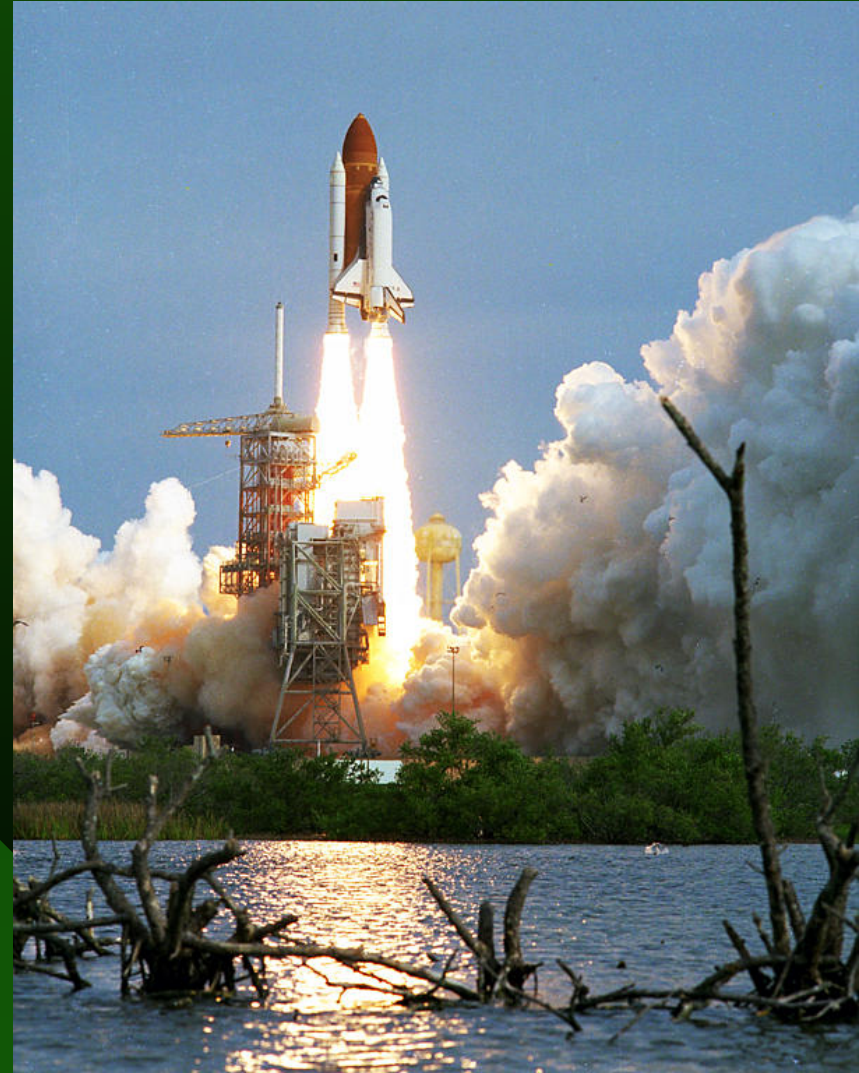
E2/CP assessments at Canada's 2 largest wineries are justifying conversion to a direct fired boiler and chilled process vessel insulation

Process Electricity Conservation

Kennedy Space Center and Cape Canaveral, Florida

Enviro-Stewards staff designed Cleaner Production Upgrades to:

- Recycle 100% of the water used to pressure clean the Space Shuttle's Solid Rocket Boosters
- Reduce waste from the Thrust Vector Control Clean Room 67%; and
- Decrease cooling system blowdown.



SRB Refurbishment Facility, Kennedy Space Center

Energy Efficiency
measures also
streamlined the production
process, boosted ozone
generator efficiency,
eliminated a pumping step
and reduced cleaning bath
heat losses



Compressed Air Savings



Conversion from high pressure/low volume to low pressure/high volume compressed air for 5 psi pressure tests

This freed up compressed air supply for a soluble media blasting alternative to methylene chloride identified during CP study

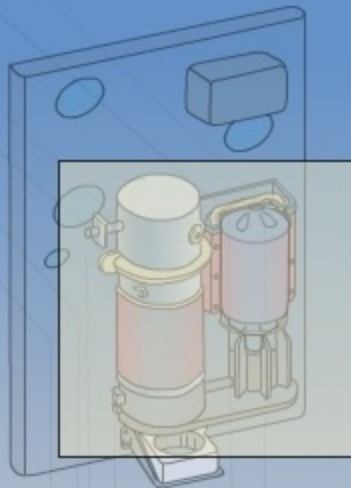
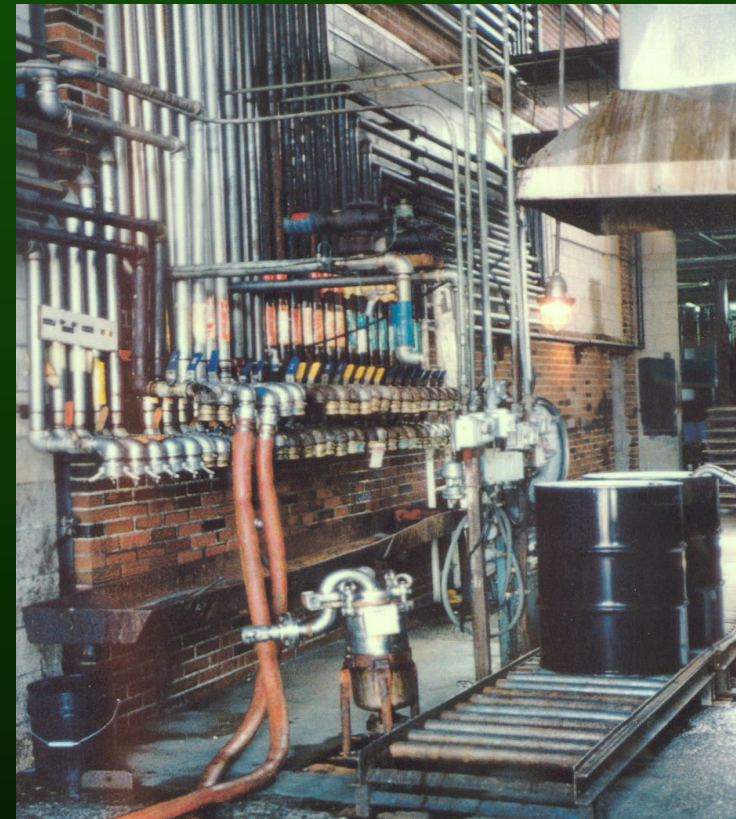
Conversion from drilled compressed air pipes to mechanical mixing with air spargers for mixing

A wastewater pumping step was also eliminated at this food manufacturer



Transportation and Product Transfer

CP measures to
reduce losses
during transfer
reduced BOD₅
loading by 67%
eliminating a
\$1,500,000
wastewater
treatment
expansion and
associated energy
consumption



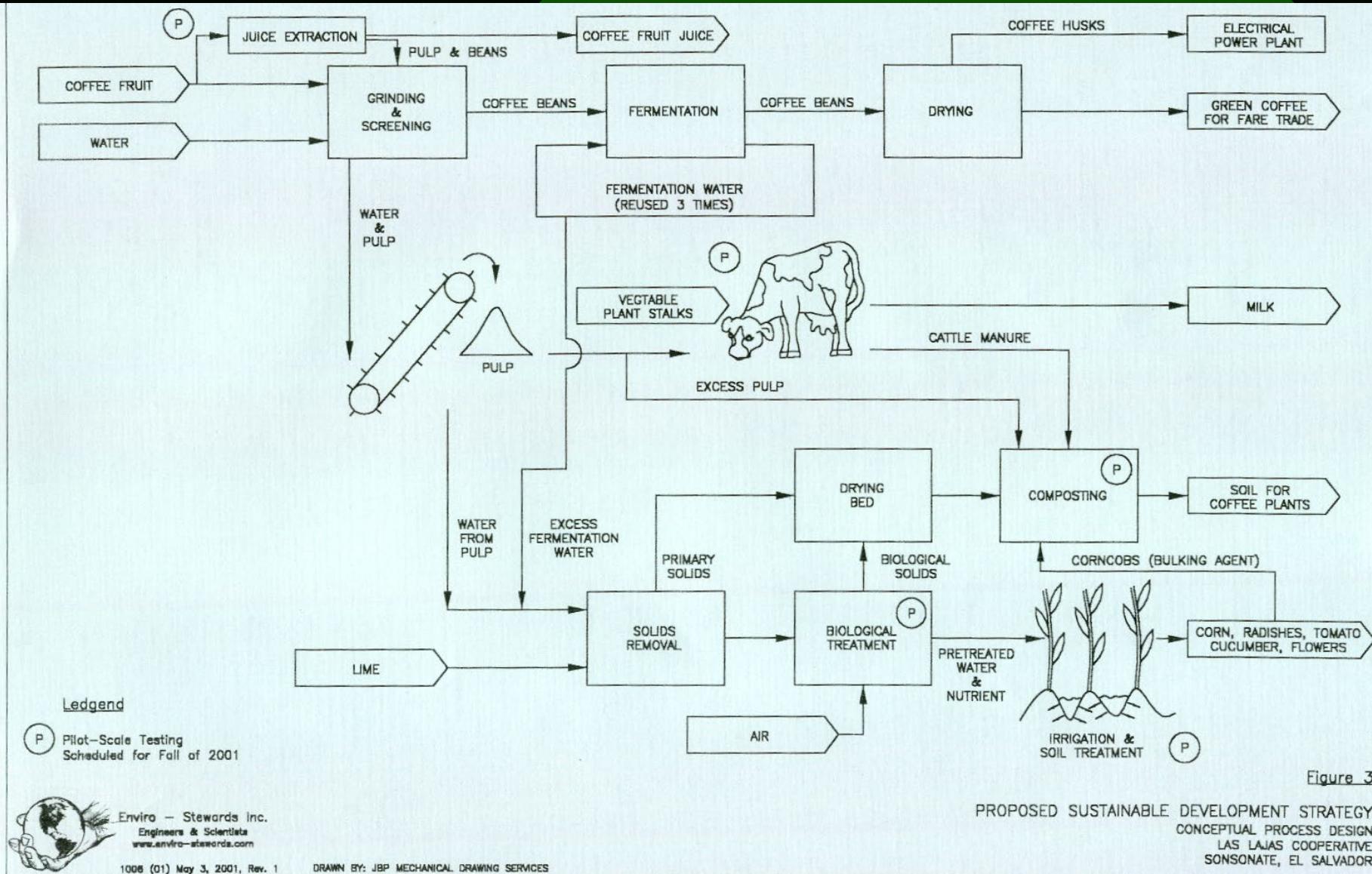
Enviro-Stewards is assisting Dynamic Fuels
(Pickering) to test a hydrogen based Jetstar
process to increase diesel combustion
efficiency and reduce emissions

Las Lajas Agricultural Cooperative, El Salvador

Sustainable Development

1. Environmental Sustainability
2. Social Sustainability
3. Economic Sustainability





Environmental Sustainability Reduces Material and Energy Consumption

Social Sustainability/ Responsibility

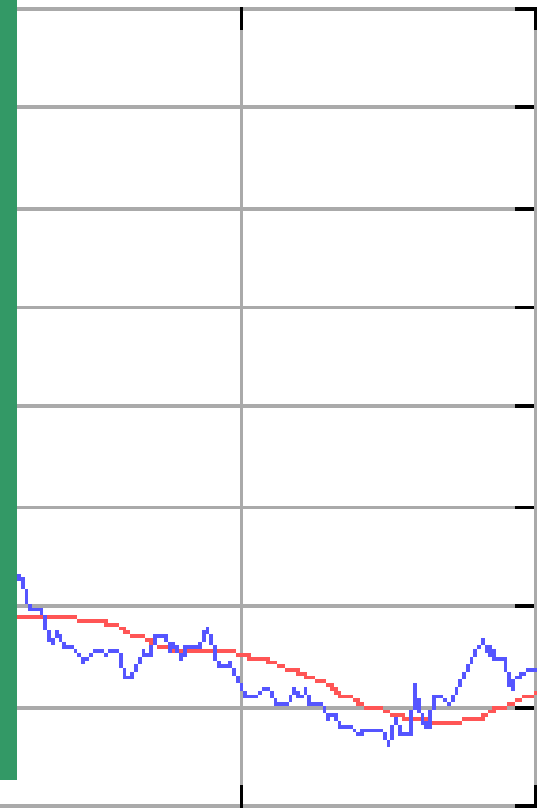
- Good Wages
- Communal Resources (Fields, Tools, Library)
- Schools, Clinics, Libraries
- Small Business Loans
- Clean Water, Air & Land



Economically Sustainable Development

Product Differentiation

- Quality of Beans & Wet Processing
- Shade Grown (lower pesticide & fertilizing requirements)
- Environmentally Sustainable
- Socially Responsible



CSCE: J

World Market Price

\$0.60/lb F.O.B NY

-20-01
no.com

Fare Trade Price

\$1.26/lb F.O.B Farm

4. Questions & Answers

Enviro-Stewards Inc.

1 Union Street

Elmira, Ontario

N2B 3J9

www.enviro-stewards.com

(519) 578-5100

btaylor@enviro-stewards.com